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The object of this Bulletin is to provide a guide to medical science and thought in Britain, and it consists mainly of summaries of a representative selection of British papers on subjects of medical interest. Any material appearing in the Bulletin may be published without fee, but acknowledgement of the source, by addition of the initial letters BMB followed by the serial numbers of the items selected, would be appreciated. The Bulletin is not distributed generally to the medical profession.

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MEDICAL FACULTY. McGILL UNIVERSITY

SPECIAL CONTRIBUTION

MEDICAL EDUCATION IN GREAT BRITAIN

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To understand any existing scheme of organisation it is first necessary to examine its antecedents. This is no less true of systems of education. Broadly speaking, the different systems of medical education which exist to-day had their origin from one of two distinct sources. They either arose from university departments of theoretical medicine or they arose from a system of apprenticeship to practising doctors. Medical education in England sprang from the latter source, and to-day the traditions of apprenticeship, though now developed and modified, are still responsible for its most characteristic features.

In the mediæval University, teaching was characterised by authoritative statement and little more was expected from the student than that he should imbibe without question the information thus presented. Under such a system the role of the student was largely passive, personal contact between teacher and learner was not fostered and the road to success lay in unquestioning acceptance of authorised beliefs rather than in personal observation of actual sick patients. The method of the apprentice system was entirely different. Its keynote was personal experience, and to this end the student attached himself to a master of the craft whom he assisted in the actual practice of his art. An intimate contact between teacher and student thus arose; a contact in which the teacher felt a personal responsibility for the education of his student and in which the student was able to discuss his difficulties, report his observations and judge his teacher by the test of actual competence. The different influences of these two systems still mould modern medical education. In those countries in which the teaching tradition springs from the mediæval University, the centre of the teaching is the formal lecture or lecture-demonstration; in those countries such as England, in which teaching derives from the apprentice system, the centre of the teaching is the actual care of patients by the students acting under the personal supervision of the teacher.

With the advancement of medical knowledge, however, the original primitive apprenticeship proved inadequate as the sole basis of training, and rapidly, perhaps because of the relative freedom of this system from authoritative doctrine, new methods of training were incorporated. Anatomy was early taught systematically, morbid anatomy soon followed, and then there was a pause until the great schools of physiology and pathology arose and in their turn were taken into the system.

These are the forces which have shaped, and are still shaping, British medical training, and it is now proposed to outline the actual scheme which they have brought into existence.

The course of medical training lasts 5½ to 6 years and the student usually commences the course at the University when he is 18 or 19 years of age. Before entering the University he must have taken an examination in general education, languages, mathematics, and at least one, more usually two, branches of science. The first year is spent in a further study of chemistry, physics and biology and at the end of this time he takes his first medical examination. After passing this examination he studies anatomy, physiology, biochemistry and pharmacology for a period of eighteen months and then takes his second medical examination.

Superficially this scheme of education differs little from that existing all over the world; but in practice there are certain significant differences. For example, relatively few lectures are given in the anatomy course; instruction is gained almost entirely from dissection. Each student dissects the whole body. On his own responsibility he dissects a particular region and then a demonstrator questions him on his findings and explains difficulties. Again in the physiology course, although there are many lectures, all students carry out numerous experiments for themselves. Of recent years these two courses have become increasingly directed to the living subject. Much anatomy is learnt now by the students on their own bodies and the functional aspect of the structures studied is stressed. In physiology most experiments are on the human subject; reflex action, metabolism, etc. are investigated by the students on their own persons. But perhaps the most obvious influence of the apprentice tradition is seen in all these subjects in the striving, whenever possible, to avoid large classes and to give individual and personal tuition to small groups of students.

After passing the second medical examination, the student enters the hospital. Here he is exposed to the two different methods of teaching. In pathology, bacteriology, etc., the teaching is predominantly academic in type, although the same tendencies as were noted in the teaching of physiology and anatomy ensure that individual tuition and the performance of experiments by the student play a prominent part in the course. It is in the teaching of the actual clinical subjects that the characteristics of British medical education are best seen. After a preliminary course of three months, in which the student learns under supervision how to question and examine the patient and to carry out simple investigations on the blood and urine, the students are divided into small groups, each of six or eight persons, which are known as "firms." Each firm is accredited to a member of the hospital staff who has an intern and a registrar (junior physician or surgeon) to assist him. The student now finds himself responsible for certain aspects of the care of four or five patients. He must question the patient and write an account of the illness; he must examine the patient and record his findings; and he carries out the simpler chemical investigations required. In case of difficulty he may ask help of the registrar who, in any case, checks the student's notes and points out any errors. The physician or surgeon in charge of the firm visits the patients with the students and on such visits each student is questioned, and asks questions, about the patients for which he is responsible. Each firm is also responsible for an out-patient clinic, and here also the student takes an active responsibility in dealing with the patients. In addition to such visits with his own firm the teacher takes larger groups of students round the wards. On these occasions it is the custom to select cases of a similar type or dissimilar patients illustrating a particular important clinical point and, starting with the actual patients present, to discuss the whole problem of which they constitute examples.

The first firm to which the student is attached is usually a medical firm. Thereafter he is appointed to a surgical firm, an obstetric firm, an ophthalmological firm, the clinical pathology unit and so on. On the surgical firm he not only carries out the duties mentioned above but he assists with operations, dresses the wounds after operation, and in the out-patient clinic takes part in the treatment of minor injuries and surgical conditions. During his appointment to the obstetric firm he delivers women both in hospital and in their own homes.

It should be clearly understood that it is compulsory for all students to serve appointments in all branches of clinical medicine. A student might wish to take some appointments and not others; he must, however, take all, and before he can enter for his final qualifying examination he must produce a certificate showing that he has discharged his duties satisfactorily in every one of his clinical appointments.

It will thus be seen that the keynote of clinical teaching in Great Britain is to give the student personal contact with sick persons. As, however, in the short period of medical training a comprehensive experience is unlikely to be gained through personal experience, this teaching is supplemented

by lectures and lecture-demonstrations. It is significant, however, of the relative importance attached to clinical instruction on actual patients and to teaching by lectures and demonstrations that, whilst the former is compulsory, attendance at all lectures is generally optional.

An innovation in practical teaching which is meeting with much success is the clinico-pathological meeting. For some years now such meetings have been held between the members of the clinical staff of the hospital and the pathologist, and the full and frank discussions on fatal cases thus made possible have undoubtedly been of great value. At some hospitals such meetings are now being held with students and they are proving such a success that they are likely to be generally adopted. At these meetings the student who has attended the patient during life first gives an account of the case, and the pathologist then discusses the *postmortem* examination. The students then discuss the case and question, and not infrequently criticise, the physician or surgeon who was in charge of the patient. Finally, the physician or surgeon discusses the case as a whole and the condition of which the case is an example,

It will be appreciated that under the system described considerable freedom is given to the individual teachers and the different medical schools to develop their courses of instruction according to their particular ideas on the subject rather than in conformity to a rigid schedule of academic instruction. This liberty is further facilitated by the fact that there is no State qualifying examination in Great Britain. The final examination of each University and of each of the independent Colleges of Physicians and Surgeons qualifies the holder to be entered in the official register of medical practitioners and thus to enjoy the legal privileges and responsibilities of a recognised practitioner of medicine.

It might well be asked whether the system taken as a whole does not allow too much liberty so that there is a real danger that the many different examinations may differ widely in standard. If there were no further safeguard this possibility would undoubtedly exist; but the danger has been foreseen and provided against. A body called the General Medical Council has long been in existence. This body, set up by the authority of the Government, is composed of medical men, and one of its duties is to lay down the general scheme of medical teaching and the minimum standards which a final examination must attain if it is to be accepted as entitling the holder to registration as a practitioner. This Council has considerable power, for it can, if it considers fit, refuse to recognise a particular final examination as entitling to registration. In practice the Council has used its powers wisely. Instead of laying down rigid and detailed schedules of clinical instruction, which it might well have done, it has contented itself with indicating on very broad lines the scope of medical teaching considered desirable. In this way it has left the different Universities and Colleges the freedom within wide limits to follow their own inspiration regarding teaching. Similarly the Council has not constituted itself an examining body. It has allowed the different teaching bodies to conduct their own examinations but, at the same time, it has controlled the general standard of the qualifying examination by appointing inspectors to attend, to report on and, should they so desire, to take part in these examinations.

In this brief outline of the British system of medical education as it exists to-day, an attempt has been made to display the principles which inspire the methods used. The system is now very different from the simple apprentice system from which it derived, but it still retains certain characteristics of that system. Not least of these is an ability rapidly to adjust practice to experience even in the matter of education; and in this it would seem to have an advantage over more rigid and doctrinaire systems.

Dr. Himsworth was appointed Professor of Medicine at University College Hospital, London, in 1939. He has been responsible for researches into the nature of metabolic diseases, especially diabetes mellitus, the functions of the endocrine glands concerned with metabolism, and the pathogenesis of necrotic and cirrhotic conditions. Since the war he has been honorary secretary of the Medical Research Council's Committee which advises on the distribution of food to invalids and persons on special diets. He is also a member of the British Medical Association's Commission for the replanning of the British medical services and of a committee of the Royal College of Physicians on the replanning of Medical Education.

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PARATYPHOID FEVER: AN EPIDEMIOLOGICAL STUDY

by W. Savage, *Journal of Hygiene*, **42**, 393–410, July, 1942

The author, who is a British public health administrator of long experience, especially in the bacteriology and epidemiology of infections conveyed by foodstuffs, has made a valuable survey of outbreaks of paratyphoid B fever. He has taken as his material the data from forty epidemics which occurred in Great Britain between 1923 and 1941, supplemented by observations from certain American outbreaks. One object of the study was to compare the characters of paratyphoid fever with those of typhoid fever and food-poisoning due to organisms of the Salmonella group.

While paratyphoid B fever usually takes the form of a prolonged febrile illness of "enteric" type, cases may start with vomiting and diarrhœa, and thus resemble acute food-poisoning. In one outbreak where there was a massive infection, 43 out of 56 persons affected had these initial symptoms, and in 9 of them the usual enteric type of illness did not develop.

The incubation period, which is usually about 10 to 12 days, may be as long as 24 days or, if the infecting dose is large, as short as 4 days. The vehicle of infection will largely determine the age and sex distribution of the cases. For example, the majority of patients will be children when the infection is conveyed by ice-cream. In Great Britain epidemics have usually commenced in early summer.

Waterborne outbreaks are rare and in the authenticated instances pollution of the supply has been very heavy. In 80% of the epidemics some article of food was responsible, and in 40% that article was cream, especially artificial cream used for cake fillings.

The responsible food is usually one in which the organism can multiply, and when the food has been kept for a time in warm weather a high proportion of those consuming it may become infected. Except in these circumstances, however, the proportion of those at risk who develop the disease may be small, and outbreaks may show an intermittent rather than an explosive character.

Almost invariably numbers of persons will be found to be excreting the organism without symptoms. These individuals, unrecognised ambulant cases and convalescent patients continuing to excrete *Bact. paratyphosum B*, are the persons likely to start or spread an outbreak. Careful study of the history and of the bacteriological and serological findings may be necessary to determine whether such a person is the cause or a victim of a particular epidemic. In the present series chronic carriers could rarely be proved responsible.

In its case-mortality (at most 1·76% for this whole series) and the necessity for a large infecting dose, paratyphoid B resembles Salmonella food-poisoning. In contrast to the typhoid bacillus which is invasive and strictly parasitic on man, the Salmonellas are irritant, non-invasive and parasitic on many animal species. The author's view is that *Bact. paratyphosum B* is in the process of evolution from a Salmonella-like ancestral type towards an invasive typhoid-like type of organism. With the possible exception of several reported outbreaks associated with dogs in Scandinavia, *Bact. paratyphosum B* is parasitic only to man. Strict parasitism to a single host cannot readily be maintained by an organism with irritant properties as these lead to rapid expulsion from the body. Invasive properties, associated with bacteræmia and growth in the body tissues, are therefore being evolved. The symptoms and epidemiology of paratyphoid B lend considerable support to this theory.

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IMMUNISATION WITH T.A.B. IN AN OUTBREAK OF PARATYPHOID FEVER

by E. C. Dax and D. M. Stone, *Lancet*, **2**, 422–424, 10/10/42

A Medical Superintendent of a mental hospital and a Bacteriologist to an *Emergency Public Health Laboratory* report an outbreak of paratyphoid fever among a mixed group of demented and mentally defective patients. In the hospital involved, only one villa, which accommodated 80 patients, was affected. The majority of these were incontinent and unclean in their habits, and 19 of them developed symptoms of pyrexia with acute gastro-enteritis. There were 4 deaths, all in idiots.

Nineteen days after the first case occurred, those patients who had shown no clinical signs of the disease were given, at weekly intervals, 3 doses (0·2 cm.³, 0·5 cm.³ and 1 cm.³) of a T.A.B. vaccine containing 1000 million *Bact. typhosum*, 700 million *Bact. paratyphosum A* and 500 million *Bact. paratyphosum B* per cm.³ The epidemic ceased abruptly after the first dose of vaccine, although previously cases were becoming more frequent. Twenty-three additional patients were then found to be excreting *Bact. paratyphosum B* in their fæces without showing any clinical evidence of infection.

Fæces were examined by culture on McConkey's medium (a) directly and (b) after preliminary incubation in sodium tetrathionate broth and in peptone water containing brilliant green in dilutions of from 1 : 70,000 to 1 : 1,000,000. Combination of these three methods was found to give the greatest efficiency.

The authors comment on the high ratio of non-clinical carriers to clinical cases. The reasons for the abrupt termination of the epidemic are not clear, as it is accepted that antibodies do not begin to appear in the serum until 5–6 days after the first immunising dose. No harmful effects appear to have been produced by immunisation of patients after exposure to infection. The carrier-rate was not appreciably influenced by immunisation.

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BACTERIOLOGICAL OBSERVATIONS ON THE AIR OF OCCUPIED PREMISES. I. Air disinfection with hypochlorites. A simple practical method of disinfecting the air in occupied premises

by S. W. Challinor, *Journal of Hygiene*, **43**, 16–54, January, 1943

The crowded living conditions which may occur in wartime, for example in air-raid shelters, increase the risk of epidemics due to air-borne infection. For this reason the disinfection of air by a fine spray or " mist " of disinfectant (an " aerosol ") described by Pulvertaft & Walker (1939) has been further developed. The present author, of the Bacteriology Department in the *University of Edinburgh*, has studied the effect of hypochlorite disinfectants used in this way.

The experiments were carried out in an unventilated room of a capacity of 1,700 cubic feet (about 48 m.³) occupied by from 14 to 17 men. The disinfectants used were (*a*) a 1·3% suspension of bleaching powder (calcium chlorohypochlorite), (*b*) a commercial preparation of sodium hypochlorite in alkaline solution diluted so as to contain 1% of hypochlorite. This solution contained about 3 times as much available chlorine as (*a*). The solutions were sprayed either through an atomiser which gave a mist (or " aerosol ") or through a " *Flit* gun " [*Flit* is a commercial insecticide] which gave a relatively coarse spray. Both were found effective.

The bacterial content of the air was sampled on blood agar plates through the " slit sampler " described by Bourdillon, Lidwell & Thomas (1941). The plate was rotated on a gramophone turntable while air was drawn over it through a slit 0·25 mm. wide × 27·5 mm. long × 3 mm. deep, the lower edge of the slit being 3 mm. from the surface of the agar. Air was sucked through the slit and over the surface of the plate at the rate of 1 cubic foot (0·0283 m.³) per minute by the pump of a vacuum cleaner. The colonies on the plate were counted after incubation at 37° C. for 30 hours.

The number of bacteria in the air was found to fall immediately after spraying and to begin to rise again 15 minutes later. The reduction in the number of bacteria after one spraying with the sodium hypochlorite solution was of the order of 33 per cent., and the bacterial content of the air could be kept at a low level by repeating the spraying every 15 minutes. The concentration of hypochlorite solution in the air averaged 0·38 cm.³ per million cm.³ of air; it did not produce any significant irritation of eyes or nose, though the smell was perceptible. The bleaching powder suspension was slightly less effective than the sodium hypochlorite solution.

Tobacco smoke interfered considerably with the action of the hypochlorites and spraying was ineffective if the relative humidity of the air was below about 71% at temperatures from 54° to 74° F. (12·2° to 23·3° C.).

The author considers the sodium hypochlorite spray a cheap and effective method of reducing the risks of air-borne infection in crowded rooms.

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STAPHYLOCOCCUS AUREUS IN THE MILK OF NURSING MOTHERS AND THE ALIMENTARY CANAL OF THEIR INFANTS : A Report to the Medical Research Council

by J. T. Duncan and J. Walker, *Journal of Hygiene*, **42**, 474–484, October, 1942

The authors, working in the pathological laboratories of the *Emergency Public Health Laboratory Service* in London, found *Staphylococcus aureus* in the fæces of six infants suffering from mild diarrhœa with green stools. Though no causal connection between the organism and the disease was found, either at that time or later, these workers thought it worth while to study the incidence of the organism in mothers and infants in two hospitals.

The mother's milk was sampled by cleaning the nipple with sterile water and gauze, expressing two jets of milk and then directing a third jet on to a throat swab without allowing the swab to touch the skin. In the infant the throat and rectum were swabbed. In all, 87 mothers with their infants were studied, in addition to 28 mothers whose infants had been still-born. The mothers with infants had *Staph. aureus* in the milk in 92·7% and 80% (two different hospitals) of cases; 91·5% and 100% of the infants had *Staph. aureus* in the throat and 74·4% and 40% in the rectum. In only 3 cases was the organism not found in either mother or baby. The growth from the milk was often very profuse. It seemed probable that the mother was usually infected from the baby, as:

(*a*) *Staph. aureus* appeared first in the baby's throat in 33 cases, simultaneously in mother and baby in 39 cases and first in the mother's milk in only 15 cases.

(*b*) Only 21·4 per cent. of mothers without babies had *Staph. aureus* in the milk.

(*c*) The colostrum of 8 women examined before parturition in no case yielded *Staph. aureus.*

The authors suggest that the throat infection is maintained in the hospital ward by passing from baby to baby and that the baby's throat infects the mother's mammary ducts.

All the staphylococci were grouped by metabolic and agglutination reactions. In one hospital 94·3% fell into only two groups; in the other hospital no group predominated. Some minor septic lesions in mothers and babies

were caused by staphylococci of the same groups, but there was no important illness or epidemic due to *Staph. aureus* during the investigation, which lasted a year.

Staphylocoagulase reaction. Some staphylococci have the power to clot citrated plasma either by a free coagulase liberated into the culture medium or by the direct action of growing cocci. This clotting power has been regarded as evidence of pathogenicity (A. M. Fisher, 1936). None of the staphylococci examined in this work produced a free coagulase but many living cultures caused clotting. The authors found that the speed of clotting and the density of the clot varied with the dilution of culture and plasma. The test was conveniently carried out by titrating a series of diminishing concentrations of plasma against a uniform dose of staphylococcus culture (*e.g.* 1,000 millions of cocci per $cm.^3$). The end-point could be taken as either:

(*a*) the highest dilution of plasma in which a definite clot was formed, or

(*b*) the mixture which coagulated earliest; here the relation of plasma dilution to culture dilution was expressed as a ratio, and called the "optimum ratio" for clotting.

The authors suggest that clotting caused by growing cocci alone is a less reliable sign of virulence than clotting in which a free coagulase also takes part.

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32

A MEDIUM SHOWING A DISTINCTIVE GREEN COLOURATION WITH GROWTHS OF *C. DIPHTHERIÆ INTERMEDIUS*

by M. Gordon and C. Higginbottom, *Journal of Pathology and Bacteriology*, **54**, 435–442, October, 1942

The introduction of blood tellurite agar media has resulted in a marked advance in the diagnosis of *C. diphtheriæ* and particularly in the differentiation of types. Nevertheless, difficulty still arises often in the examination of nasal swabs owing to the presence in the nose of certain diphtheroids. These produce on blood tellurite agar media colonies so closely resembling those of *C. diphtheriæ intermedius* as to be almost indistinguishable, and a simple method of differentiating between them is desirable. Cooper, Happold, McLeod & Woodcock (1935–36) observed that growths of *C. diphtheriæ intermedius* on heated blood agar often showed a slight greenish tinge. This feature was, however, too variable to be relied upon as a differential characteristic.

The investigation reported in the present paper was undertaken in the *Department of Pathology and Bacteriology* at the University of Leeds, at the suggestion of Professor J. W. McLeod, with a view to producing this greenish tinge more constantly, and thus evolving a medium which would be of practical value in diagnosis. It was shown that the first essential was a heated blood agar medium of a good "chocolate" tint. However, the heating required to produce this was found to have an adverse effect on some factor in the blood which promoted the production of the green colour. This factor was shown to be present in the serum but not in the blood cells. Unheated serum was therefore added to the heated blood agar medium.

A medium giving constant and satisfactory results was made up with a basis of agar broth (adjusted to pH 8·0), containing *Lab. Lemco* (a concentrated meat extract preparation), 1%; peptone (Parke Davis & Co.), 1%; sodium chloride, 0·5%; and agar powder, 2·5%. This was autoclaved and then heated with 10% of sterile defibrinated rabbit blood for ten minutes at 75° C., after which it was cooled to 50° C. and mixed with 15% of sterile rabbit serum before pouring as plates.

On this medium:

(1) The growths of one hundred strains independently classified as *intermedius* were markedly increased and appeared rich olive green, particularly in confluent growths. The green tinge was less well marked with isolated colonies after 24 hours' growth and was best seen by reflected light, but it became quite definite after 48 hours' growth.

(2) The nasal diphtheroids yielded much finer growths, greyish in colour and devoid of greenish tinge.

(3) The *mitis* and *gravis* strains yielded exceptionally heavy growths, the *mitis* being whitish, slightly tinged with pink, and the *gravis* a greyish-white.

The greenish appearance of *C. diphtheriæ intermedius* on the medium is not due to a pigment in the growth but to a discolouration of the medium, which becomes obscured by a heavy whitish growth after 48 to 72 hours' incubation. It differs from the green colour produced by streptococci and pneumococci on heated blood agar in that it is very superficial and shows no outward diffusion from the margins of the growth. It does not appear to be a peroxide effect as no blackening occurs with growths on benzidine blood agar.

The *serum factor* promoting the effect described is definitely thermolabile. Though only slightly affected by heating for 30 minutes at 65° C., its action is almost completely destroyed by heating for 30 minutes at 90° C. It is associated with the protein fraction of serum and is not present in the ether-soluble portion. It passes through a Maassen filter unimpaired. It is also present in human, guinea-pig, horse and ox sera, but the characteristic effect described is obtained best with fresh rabbit serum.

The authors have used the medium described in this paper for some months as a routine method of differentiating between nasal diphtheroids and the *intermedius* strain of *C. diphtheriæ*, and the results have been satisfactory. A plate accompanying the original article shows the appearances on this medium of subcultures of (*a*) six strains of *C. diphtheriæ intermedius*, (*b*) three strains of nasal diphtheroids, (*c*) a *gravis* strain, and (*d*) a *mitis* strain.

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SLIT-LAMP MICROSCOPE IN NUTRITION SURVEYS: OBSERVATIONS IN SCHOOL-CHILDREN

by J. H. Kodicek and J. Yudkin, *Lancet*, **2**, 753–756, 26/12/42

This paper records the results of the examination of 496 elementary school children in Cambridge with the slit-lamp microscope. The first of the authors is Assistant Physician to the Eye Department, *Addenbrooke's Hospital*, and the second is Sir Halley Stewart Research Fellow at the *Dunn Nutritional Laboratory*, Cambridge. The slit-lamp microscope has recently been used for the detection in eyes of early signs of riboflavin and vitamin A deficiency. Although the authors are not able to indicate at the present stage the significance of the changes observed, the use of the slit-lamp for nutrition work is a recent development and they believe that the recording of the common types of findings may help in the adoption of a uniform classification and nomenclature.

Bessey & Wolbach (1939) showed that in rats a deficiency of riboflavin led to a vascularisation of the cornea. Vitamin A deficiency has long been known to produce keratinisation of the conjunctiva and the cornea. Recently various workers have suggested that the slit-lamp microscope might be used to detect early signs of riboflavin and vitamin A deficiencies. Kruse (1941) has listed a series of changes in the conjunctiva which he believes to represent progressive stages of vitamin A deficiency and Sydenstricker (1940) has described the engorgement of the limbic plexus and an increase in the capillary loops which eventually invade the cornea in progressive stages of riboflavin deficiency.

In detecting riboflavin deficiency the authors of the present paper took as abnormal only those eyes in which there was capillary invasion of the cornea, and they therefore adopted a severer criterion of abnormality than that used by Sydenstricker. By so doing they believed that only cases of true ariboflavinosis were included. A total of 19 of the 496 children showed corneal vascularity and the proportion was significantly higher in the older children—only 1·5% of children in the junior schools compared with 8% of those at the senior schools.

In attempting to find the early stages of vitamin A deficiency the authors have paid most attention to the corneal epithelium, as this is the region where vitamin A deficiency is known to be manifested. They classify the corneal epithelial changes into 5 groups:

1. Smooth, transparent conjunctival epithelium.
2. Transparent epithelium with superficial wrinkling.

3. More pronounced wrinkling.
4. Small islands with definite opacity.
5. Areas of opacity much larger.

The authors do not claim that these groups represent a continuous graded series but they think it very probable that they do. They do not claim that the corneal changes are necessarily due to vitamin A deficiency, but they find that they vary according to age, economic status and sex, being more common in the poorer class school than in the better class school, in boys than in girls, and in older than in younger children.

None of these slit-lamp findings described could be correlated with height and weight (or Tuxford's height-weight index), hæmoglobin levels, dark-adaptation, intelligence or educational attainment.

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VITAMIN C NUTRITION IN THE ROYAL NAVY AND IN A SECTION OF THE CIVILIAN POPULATION DURING WAR-TIME

by G. Z. L. McNee and J. Reid, *Lancet*, **2**, 537–540, 7/11/42

The occurrence of sore and bleeding gums in naval personnel attracted official attention in 1940, chiefly because these men were being diagnosed as scurvy or "sub-clinical" scurvy, on the hypothesis of a war-time diet deficient in vitamin C. The authors, working at the *Gardiner Institute of Medicine*, University of Glasgow, carried out an investigation on the state of vitamin C nutrition in the Royal Navy, chiefly by the use of the *saturation test* of Harris & Abbasy (1937). The subjects were 392 seamen (from destroyers and smaller craft), and 176 male civilians of similar age and social status who were fully employed in engineering were also investigated for purposes of comparison. This involved over 1,000 individual estimations.

The daily test dose was 700 mg. of pure ascorbic acid by mouth. Urine was collected from the end of the third hour to the end of the sixth hour and titrated with 2–6 dichlorophenol-indophenol. The test dose was repeated daily until there was a sharp rise in the excretion of ascorbic acid. Excretions of more than 50 mg. indicated "saturation"; 5–50 mg. "approaching saturation"; less than 5 mg. "incomplete saturation."

Results. In the Spring of 1941 the majority of naval and civilian subjects required 5 test doses for saturation. In the Autumn of 1941 the naval subjects required 3 and civilian subjects 4 doses. Capillary Resistance Tests (positive and negative pressure) showed no relation between the number of petechiæ induced and the saturation test results. Clinical examination of the mouth and gums of 118 of the sailors showed: British (72 subjects), oral condition moderate (5 with sore and bleeding gums); French (12 subjects), moderate; Canadian (13 subjects), good; Polish (6 subjects), good (1 with sore and bleeding gums); Indian (16 subjects), perfect. The Indians cleaned their teeth by their own method with a twig. Those with sore and bleeding gums showed average response to the Saturation Test, but the Indians with perfect mouths had lower reserves and a diet poor in vitamin C. The authors conclude that good oral hygiene is of major importance. A similar investigation was made on 9 civilians with genuine scurvy collected during the year in the wards of the *Western Infirmary*, Glasgow. None of these showed sore and bleeding gums in their edentulous jaws, and only 1 out of 5 examined showed abnormally low capillary resistance. Nevertheless all had had diets grossly deficient in vegetables and potatoes for at least 4 months.

The authors' results show that (1) scurvy cannot be diagnosed from sore and bleeding gums or from diminished capillary resistance; (2) in adults relying on potatoes or vegetables for vitamin C, a state short of "saturation" is the rule, although they remain in good health which shows no improvement after "saturation."

It is suggested that *in adults* ascorbic acid is concerned mainly with tissue repair and that the maintenance requirement for ordinary health and work is small and has not yet been accurately determined.

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35

CRITIQUE OF THE SATURATION METHOD FOR DETERMINING VITAMIN C LEVELS

by L. J. Harris, *Lancet*, **1**, 644–646, 30/5/42

The author, who is Director of the *Dunn Nutritional Laboratory* at Cambridge, points out that there have been many criticisms of the saturation method for assessing vitamin C deficiency, and he feels that those criticisms should be considered.

The saturation test for vitamin C deficiency is based upon the fact that the amount of a large test dose of vitamin C retained by the tissues is proportional to the pre-existing deficiency, which is revealed by the smaller amount excreted in the urine. The amount excreted can be estimated by titration of a sample of urine with the dye 2, 6-dichlorophenolindophenol.

The author specifies 12 objections which have been made to the saturation test at various times. These, and his comments, may be summarised as follows:

1. *The titration technique is not specific for vitamin C.* The technique is sufficiently specific to measure the relatively large quantities of vitamin C excreted in the urine in the saturation test without significant prejudice to the results by interfering substances.
2. *The standard of saturation is uncertain.* When saturation is actually attained in any individual there is an unmistakable sudden and steep rise in the excretion of vitamin C, hence it makes little difference which arbitrary figure is taken as representing the standard of saturation.
3. *After saturation, there is still a wide fluctuation of excretion of the vitamin.* The fluctuation of excretion does not in practice make it difficult to fix a lower limit for excretion, because the initial saturation level is usually fairly constant for subjects of the same weight.
4. *Individuals vary in their response.* Subjects kept at the same intake of vitamin C have actually shown less variation in excretion than might be expected.
5. *Other factors (fever, muscular work, kidney function) influence the excretion.* In all the conditions mentioned the tissues are depleted of vitamin C to a different extent and it would therefore be expected that the saturation levels should vary.
6. *Analysis of blood vitamin C is preferable to the saturation test.* Analysis of the blood vitamin C is no more accurate than the saturation method and the latter is more convenient.
7. *The requirement depends on the body weight or age of the subject.* If test doses are given in proportion to the body weight and the values for the excretions of vitamin C are reduced to a body weight basis, these variations due to weight and age are reduced to negligible proportions.
8. *The accepted standard for the requirement of vitamin C is unnecessarily high.* It matters little whether the standard for normal vitamin C intake is too large or small, as the values from the saturation tests still have considerable comparative significance.
9. *A subject may be well below standard yet still in apparently good health.* Even if the thesis is accepted (which the author does not do) that absence of scurvy means sufficient vitamin C, the saturation test would still be useful in determining how far a subject was from the scurvy level. Evidence from all human and animal experience, however, indicates that the amount of a dietary essential needed for normal health is greater than the bare amount needed to prevent frank deficiency disease.
10. *Saturation is not necessary for optimum nutrition.* The use of the saturation test for estimating vitamin C deficiency does not necessarily imply that saturation is desirable, but rats, which synthesise their own

vitamin C, are saturated with the vitamin. The same is true for guinea pigs in their natural state.

11. *Vitamin C is not stored in the body, therefore the term "vitamin C reserves" is misleading.* Whether one talks of "reserves" or "degree of saturation" matters little, since the object of the test is simply to appraise the previous level of intake of vitamin C.
12. *Presumably a subject can adapt himself to low or high levels of intake of vitamin C and his response to saturation tests will then vary accordingly.* This objection is chiefly theoretical, since in practice subjects are found to respond in proportion to their past intakes.

The author concludes finally that the urinary saturation test for estimating vitamin C "reserves" of the body can be regarded as reliable.

36

COMPARATIVE DIGESTIBILITY OF WHOLEMEAL AND WHITE BREADS AND THE EFFECT OF THE DEGREE OF FINENESS OF GRINDING ON THE FORMER

by T. F. Macrae, J. D. C. Hutchinson, J. O. Irwin, J. S. D. Bacon and E. I. McDougall, *Journal of Hygiene*, **42**, 423–435, July, 1942

The experiments recorded in this paper from the Department of Nutrition of the *Lister Institute* and the School of Agriculture and Animal Pathology of the *University of Cambridge* had two objects: (*a*) to provide further information on the relative availability of the constituents of white and wholemeal breads, and (*b*) to find whether the fineness to which wholemeal flour is ground affects the digestibility of the bread.

The usual method of determining digestibility was used by the authors (*i.e.* subtracting the output in fæces from the intake and expressing the result as a percentage of the latter).

The authors point out that there are objections to this method, because some material is contributed to the fæces from the secretions of the alimentary canal and because 10–30% of the dry weight of fæces is made up of bacteria. To avoid these fallacies therefore it was necessary to plan experiments according to a suitable statistical lay-out. There were six subjects and each was to be given three treatments (white bread; wholemeal bread from medium ground flour; and wholemeal from fine flour). There were six possible orders in which these treatments could be given and one order was assigned to each subject at random. With this lay-out, the effects of periods, persons and treatments would be separated by the ordinary analysis of variance. The experimental period of feeding lasted seven days, and during this period fæces were analysed for nitrogen fat and crude fibre. The subjects of the experiment were all healthy young males leading fairly active lives.

The average digestibility of the three breads in the six subjects tested is summarised in the following table:

	Total Energy	*Crude Protein*	*Ether Extract*	*Crude Fibre*	*Total Carbohydrates*
White Bread .	96·1	91·1	80·6	65·8	98·7
Fine Wholemeal Bread .	86·9	85·3	76·2	14·0	88·6
Medium Wholemeal Bread .	87·1	85·7	73·2	9·7	88·9

In every case, therefore, the figures for average digestibility of white bread differed significantly from those for the wholemeal breads, and there was 10% more energy derived from white bread. The experimental subjects were unable to eat more of the wholemeal bread to make up for the difference in energy and the authors suggest that it is important to bear this fact in mind when considering the diet of heavy workers. There was no difference in the digestibility between fine and medium wholemeal bread.

37

DIGESTIBILITY OF NATIONAL WHEATMEAL

by H. A. Krebs and K. Mellanby, *Lancet*, **1**, 319–321, 14/3/42

In this paper from the Department of Biochemistry of the *University of Sheffield* the authors refer to the opinion recently expressed by Wright (1941) that the use of an 85% extraction flour [*i.e.* a flour representing 85% of the whole grain] would result in a reduction in the quality and quantity of protein available for human consumption, because the higher extraction flour would not be as well digested as the pre-war white flour of 75% extraction. As the higher extraction flour is now the national standard in Britain and no previous data had been published on its digestibility the present authors felt that this question should be investigated.

Experiments were carried out on 6 voluntary human subjects who lived under controlled institutional conditions and who conscientiously observed all their instructions regarding the diet and the collection of excreta. They were fed on a mixed diet containing 700–900 grams of bread, providing about 4,000 calories a day. Fæces and aliquot samples of food were analysed in weekly periods; 0·7 g. of carmine was used for marking the fæces. The white flour used in these experiments was of 75% extraction, while the national flour was of about 85% extraction and contained 0·45% of fibre. About 90% of the flour was eaten in the form of bread, the rest in the form of puddings, sauces and cakes. Digestibility in this paper is defined as the value of

$$\left(1 - \frac{\text{amount of food residue in fæces}}{\text{amount of food ingested}}\right) \times 100$$

The dry weight and nitrogen content of the fæces were determined. It was found that on an average 94% of the dry matter and 89% of the nitrogen of the national flour were digested. Of the 75% extraction flour 97% of the dry matter was found to be digested and it was calculated from the data published by Macrae, Bacon, Hutchinson & McDougall (1941) that 91% of the nitrogen is digested. The authors point out that the difference in the digestibility of the two flours is much smaller than has been suggested by Wright and that they are therefore unable to substantiate his objections to raising the extraction of wheat flour to 85%.

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38

PHYSICAL TREATMENT OF ACUTE WAR NEUROSES —SOME CLINICAL OBSERVATIONS

by W. Sargant, *British Medical Journal*, **2**, 574–576, 14/11/42

Experience gained in the present war has shown that physical methods play an important part in any comprehensive scheme for the treatment and rehabilitation of patients with acute war neuroses. The aim of physical treatment is to build up the constitution so that unavoidable stresses are better tolerated by the individual. Over 3000 military patients, in addition to non-military cases, have had to pass through a limited bed accommodation at the *Emergency Medical Service* Neurological Unit of which the author is Deputy Director, and there has thus been a pressing need to find a means of accelerating processes of normal recovery so that patients may improve sufficiently to return either to readjusted duties in the Armed Forces, or to some useful civilian occupation.

Unparalleled opportunities of testing and developing such methods have occurred in the author's unit. Patients were received direct from the Dunkirk beaches, and other acutely ill Dunkirk patients were admitted, months or weeks later, after an interval during which their condition had often gravely deteriorated. During the aerial Battle of Britain and during the aerial bombardment of London, numerous other acutely ill patients were received who had broken down either in the Services or in the Civil Defence organisations.

The most important finding in these cases was the need for immediate first-aid treatment of the acute neurosis occurring in patients of previously good personality, and this should be applied within hours rather than days. The response depends not only on the speed with which the treatment is given but also on innate qualities of personality. Alcohol, paraldehyde, sodium barbitone and sodium amytal can all be used in large doses as a first-aid treatment to arrest acute panic reactions as soon as they occur. Sometimes intravenous injections of barbiturates may be necessary to obtain more immediate effects, and they may also be

used to help in the rapid abolition of hysterical conversion symptoms as soon as they occur. The drug is injected to produce a state of mental relaxation, and the patient is persuaded while under its influence to regain the function of the affected part.

Continuous narcosis is desirable if severe anxiety or hysterical symptoms have persisted for even a week or longer; by the end of this time physical changes will have become more pronounced and conditioned fears will have become firmly established. The aim of this treatment should be to produce 20 hours' sleep daily for seven to ten days.

A new form of modified insulin treatment (Sargant & Craske, 1941) has been used on patients who show anxiety and hysterical responses in a good previous personality and who have lost one to three stones (6–20 kg.) as a result of long periods of stress. Such patients may appear superficially responsive to psychotherapy but often relapse under further strain unless the physical deterioration from which they suffer has also been remedied. A dose (20–100 units) of insulin just insufficient to produce coma is given to the fasting patient in the early morning. Three hours later a cup of tea containing 2 ounces (56 g.) of sugar, and 12 ounces (340 g.) or more of potatoes (these are used to save sugar) is given. A full lunch is provided 2¼ hours later.

The treatment has been used in over 300 patients. Its object is to produce drowsiness and hunger. Appetite is often enormously increased, and second or third servings of potatoes are urged on the patient. In suitable cases, great improvement in weight and physical condition is obtained, and there is a parallel improvement in the mental state. The treatment is not effective in states of severe depression. On recovery the patients are sent to modified duties or some less exacting environment, as they remain conditioned to their past experiences and there is no evidence that the treatment alters their normal resistance to stress.

Convulsion therapy has been found useful for patients who are severely depressed, do not put on weight despite the modified insulin treatment described above, and who, if left alone, may have to wait many months for spontaneous recovery to occur, even if they are immediately discharged from the army or removed from stress. The author believes that 75% of patients with a good previous personality and genuine severe depression may be expected to benefit from convulsion treatment.

He concludes that methods of physical treatment may be valuable aids to shortening the period of total disability in patients with good previous personality suffering from acute panic states, acute anxiety states, anxiety hysteria, and states of depression. These methods must be employed in conjunction with the usual psychotherapeutic and environmental treatments. Clinical experience and discrimination in the selection of suitable cases is necessary if full benefit is to be obtained from the use of physical methods.

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39

EMOTIONAL AND COGNITIVE CHANGES IN THE POST-TRAUMATIC CONFUSIONAL STATE

by A. Paterson, *Lancet*, **2**, 717–720, 19/12/42

This paper is from the *Emergency Medical Service* Brain Injuries Unit at Edinburgh. The author points out that conscious activity in man comprises many different functions which must all be present before human behaviour can be said to be normal, and which can be eliminated selectively by the various types of brain lesion. This selective disintegration of mental activity and conscious behaviour depends on the site and nature of the lesion.

In normal speech there is a general background of syntax and grammar which is grossly impaired by lesions in the temporo-parietal area of the cortex, and this background is rendered inaccessible for the aphasic patient. Lesions of the occipito-parietal area give rise to acalculia, the system of arithmetical principles being inaccessible. Lesions somewhere in the region of the third ventricle are liable to disturb the wider background of spatial and temporal relationships. The same rule of breakdown and recovery after cerebral lesions applies to the other higher cerebral functions, memory and orientation, perception and imagination, and maintenance of emotional attitudes and stable behaviour patterns.

In the present investigation cases of gross confusion were studied in detail as they present the most complete breakdown of ordinary conscious activity and reveal it in its simplest form. The commonest cause of this breakdown in the author's cases was severe concussional brain damage. The stages in recovery from confusion indicate the way in which the complex mental processes become restored. By the psychiatric study of those cases from the earliest stages in a special unit, information is being acquired on their course, management and disposal. This psychiatric approach and its application to the study of disturbances of cerebral function is dependent on the concepts evolved by Hughlings Jackson, Henry Head, and their successors.

Goldstein accounts for the phenomena of mental disintegration by application of the figure and ground principles of the *Gestalt* School of Psychology. He regards confusion as the blurring of the figure with the ground. The present author suggests that restriction of the cognitive process to single aspects of the perceived situation is of primary importance in confusional states. The background at the same time becomes inaccessible. Recovery consists of a gradual widening of the conscious field with increasing accessibility of the background. Ordinary perception consists of an object of attention with at least two types of background giving it meaning, namely, the surrounding spatial setting, and past experience of that object. The latter underlies the process of recognition. The author cites four illustrative cases in which there was a gradual widening of the field of attention from gross confusional states to a residual absent-mindedness, which may be regarded as a mild form of confusion. Strong interest and emotion may also restrict the field of consciousness, thereby permitting concentration on the relevant details of the situation covering the interest or emotion.

The affective changes found in confusional states have tended in the past to be overlooked. These emotional changes are shown by the author to be analogous in nature to the cognitive changes. Emotional attitudes are isolated and often excessive, and the normal balance between emotional trends becomes upset. In the confusional state the restriction of the cognitive attitudes and the isolation of the emotional trends reinforce each other.

Alcohol tends to restrict cognitive ability and enhance certain emotional attitudes in the normal person. When mental functioning is already impaired by head injury this effect is strikingly exaggerated by even small amounts of alcohol. Fatigue and emotional stress also exaggerate mental impairment, causing amnesic phenomena or fugue states. Restriction and fixity of cognitive and emotional attitudes can also be demonstrated in the minor personality changes so often found after severe concussion. The background of conventional, social and other standards is cut off, and the basic emotional traits such as aggression or timidity are unmodified and therefore become exaggerated. Two such cases are cited in which severe concussional head injury produced a personality change which, it is suggested, might be described as a "caricature effect."

The author concludes by stressing the importance and practical value of the study of the whole course of the post-traumatic confusional state, especially with regard to the distinction between the true post-traumatic personality change and neurotic anxiety states.

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POST-CONTUSIONAL HEADACHE

by E. Guttmann, *Lancet*, **1**, 10–12, 2/1/43

The author, who is neuropsychiatric research worker at the *Nuffield Department of Surgery*, Oxford, presents in this paper a study of the incidence of post-concussional headache in 200 consecutive cases admitted to the accident service of the Radcliffe Infirmary diagnosed as head injury. Not all these cases were available for this study, as five were wrongly diagnosed, eight died, and a few were unsuitable for other reasons. The occurrence of headache was noted at six stages, and for statistical purposes no distinction was made between mild and severe headache. All headaches were included, even if due to intercurrent disease.

As an indicator of the severity of the injury the duration of post-traumatic amnesia was used, assessed on discharge,

as suggested by Russell (1932). In 179 cases the findings were:

	Post-traumatic amnesia up to:	*Cases*
Group O	5 minutes	33
„ A	1 hour	85
„ B	24 hours	39
„ C	7 days	19
„ D	over 7 days	3

The presence or absence of headaches was recorded at the following six stages:

Stage 1: on admission or when first able to answer questions.
Stage 2: during stay in hospital.
Stage 3: on discharge from hospital.
Stage 4: when expected to be fit for work.
Stage 5: three months after accident (patients who had resumed work only).
Stage 6: six months after the accident.

The incidence of headaches (+) in the different groups and at the six stages is shown below:

	STAGE 1		STAGE 2		STAGE 3		STAGE 4		STAGE 5		STAGE 6	
Group	Cases	+	Cases	+	Cases	+	Cases	+	Cases	+	Cases	+
O	28	14	27	13	27	9	27	10	22	2	26	5
A	81	47	81	44	73	16	56	25	52	14	55	9
B	34	14	38	16	36	6	28	10	27	4	34	6
C	17	0	17	3	16	1	13	2	11	4	13	3
D	3	0	3	0	2	0	3	1	2	0	2	0
Total	163	75 46%	166	76 46%	154	32 21%	127	48 38%	114	24 21%	130	23 18%

The total number of cases under Stage 1 is only 163, because 16 of the 179 cases mentioned above were suffering from other injuries which distracted attention from the subject of this study. At Stage 2 there are 13 missing numbers, due to early discharge and absence of detailed case notes between admission and discharge. Missing numbers under other stages are attributable to similar accidental circumstances.

From the table it will be seen that on admission, or when first able to answer questions, 46 % of the patients complained of headache. While in hospital headache was present at some time in the same percentage. 21 % of the patients complained of headache on discharge from hospital. At the first follow-up appointment (*i.e.* at the time when the patients were expected to be fit for work), 38 % reported headache. Three months after the accident 21 %, and six months after the accident 18 %, complained of headache.

When the cases were classified according to the severity of the injury—indicated by the length of the post-traumatic amnesia—it was found that, up to and including the first follow-up examination, the percentage of headaches in the milder cases was persistently and significantly higher than in the severe cases. This difference disappeared three and six months after the accident. The clinical analysis of the cases with a history of headache showed that the patient's age was not an important factor. A considerable proportion of the patients had been suffering from periodic headaches all their lives. In the majority of the remaining cases, an obvious psychogenesis was present.

The author's impression, in the light of his findings, is that head injury is likely to produce headaches, but that only half of the injured notice or remember them. 80 % of the cases can be discharged from hospital free from complaints. Less than half of those discharged are left with some liability to headaches. The predisposition is psychosomatic—that is, psychological factors are as important in precipitating headaches as physical factors (stooping, heat, exertion). The author's impression is that they are even more important. Six months after the injury this predisposition still manifests itself in less than 20 % of the cases, and in some cases liability to headache in the history before the accident can be traced. In most other cases social and psychological factors either precipitate the headaches or determine the patient's attitude towards them.

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IMPLANTATION OF SEX HORMONE TABLETS IN MAN

by G. L. Foss, *Journal of Endocrinology*, **3**, 107–117, March, 1942

In 1937 and 1938 Deanesly & Parkes of the *National Institute for Medical Research*, London, first introduced the technique of subcutaneous implantation of tablets of compressed crystals of sex hormones in animals. In March 1938 the present author began to carry out at the Gynæcological Department of the *Bristol Royal Infirmary* the implantation of tablets of sex hormones into women, in some cases to avoid repeated injections in long term therapy, but in other cases with the object of studying the absorption rates of the different hormones. Tablets of œstrone, œstradiol, testosterone, testosterone propionate and progesterone were implanted in different women. The clinical results were reported in an earlier paper (Foss, 1939). The present paper is mainly devoted to a consideration of factors influencing the rate of absorption of sex hormones administered by implantation.

The tablets used were compressed from crystals of pure hormones and were either flat disks or cuboids. They were weighed and then placed in the anterior abdominal wall through a ¼-inch (1·27 cm.) incision made under local anæsthesia with 2% procaine solution with adrenalin. The tablets were inserted into a small lateral pocket in the fat to one side of the incision.

After varying periods ranging from 11 to 362 days the tablets were removed under local anæsthesia by dissecting them out of the fat and fibrous capsule with which they were surrounded. They were then washed, dried and weighed to determine the amount of absorption which had taken place.

The author points out that the rate of absorption of hormones administered by this method may depend upon:

1. The size and shape of tablets.
2. The degree of compression of tablets.
3. The relative solubility of the hormone in lipoids.
4. The degree of tissue reaction around the tablets.

Tissue capsules formed around œstrone tablets were found to be thin and to show little granulation tissue. Capsules formed after implantation of tablets of progesterone, testosterone and testosterone propionate were thicker and more fleshy, showing more granulation tissue and giant cells. Capsules formed after œstradiol implantation occupied an intermediate position. A similar gradation existed between the absorption rates of these hormones, and the author believes there was some connection between these two observations. He agrees with Emmens (1941) that, whatever may be the mechanism of absorption, the surface area of tablets will determine the rate of absorption. If a tablet is not highly compressed it will rapidly become pitted and its surface area will thus be increased. The author believes also that the relative solubilities of these hormones in the body fat plays a part in determining absorption.

The mean values of percentage loss of weight of the tablets per day give a calculated life of about 550 days for œstrone, 260 days for œstradiol, 118 days for testosterone propionate, 85 days for testosterone and 76 days for progesterone. Œstrone, therefore, is much more slowly absorbed than progesterone.

Œstrone and œstradiol tablets were implanted in women for chronic conditions needing continued œstrogen therapy, *e.g.* leukoplakia, kraurosis vulvæ and menopausal pruritus vulvæ, climacteric symptoms and galactorrhœa. Comfort was maintained in only a small number of cases for a few months. The case of galactorrhœa was not improved by œstrogen implantation but the flow of milk was temporarily arrested by implantations of testosterone and permanently arrested by testosterone propionate. A male eunuch regained full sexual function for 3 weeks after implantation of testosterone. Climacteric flushes in a woman were also relieved by testosterone propionate, which, however, had no effect when implanted into an impotent man.

As surface plays such an important part in the rate of absorption of the hormone, the author points out that when a small dose for a long time is required, a small round tablet of hormone should be implanted. Where a higher level of

dosage for a relatively short time is required, large flat disks should be used.

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42

THE ENDOCRINE SYSTEM AND HAIR GROWTH IN THE RAT

by C. W. Emmens, *Journal of Endocrinology*, **3,** 64–78, March, 1942

This paper from the *National Institute for Medical Research*, London, opens with a review of previous and often contradictory observations by other writers on the effect of the endocrine organs on the growth of hair. Disagreement of findings is attributed to the variety of methods used for quantitative estimation of the rate of replacement of hair and the lack of a definition for the term " hair-growth."

The present author studied in all instances an area measuring 5 × 2·5 cm. on the flank of the rat. This area was shaved or clipped, or depilated with barium paste. Samples of the growing hair were plucked at intervals from the regenerating area (the fine undercoat hairs were excluded). A record of the extent of regeneration was also made periodically as very few rats grew a new coat over the whole of the denuded site. The first criterion of growth was the length of the hair, the second was the area of regeneration.

Preliminary tests were made with 40 rats from the Glaxo Laboratories' Wistar colony, in which both flanks were denuded of hair. It was found that growth of new hair was not affected by the method of depilation, the area depilated, the side of the body used, or previous depilation. Part of the denuded area commenced to grow immediately, but the remaining area did not grow any hair until between 11 and 18 days in adult rats. This second growth phase occurred earlier in immature rats. In coloured rats the rate of hair growth was much more variable than in Wistar-descended albinos. Hair grew more rapidly in male than in female rats, but castration had no effect on the growth rate in males. On the other hand, the rate of hair growth in ovariectomized females was equal to that in males. It was found that in rats which had been thyroidectomized when adult, the rate of hair growth was considerably reduced.

Injection of androgenic hormones had no effect on the growth of hair, but œstrogens retarded it considerably, particularly in males. Œstrogens also caused bare patches to persist on the shaved area. Injection of pituitary extracts gave variable results. When female rats were injected with saline extracts of female rat pituitaries their hair grew more rapidly. However, if the extract was made from acetone-dried glands, there was no effect. Even a saline extract of mixed (male and female) rat pituitaries had no effect on the growth of hair in male rats. Extracts of acetone-dried pig, ox, or horse pituitary glands had no effect on hair growth in either male or female rats, and a saline extract of fresh ox pituitaries had no effect on normal or castrated male rats.

Two other steroid hormones—progesterone and desoxycorticosterone acetate—were tested, but they had no effect on hair growth.

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EARLY DIAGNOSIS OF PULMONARY TUBERCULOSIS

by R. R. Trail, *Lancet*, **2,** 413–416, 10/10/42

The author of this paper is Physician to the *Royal Chest Hospital* (London) and to the Surgical Unit at *Papworth Settlement*. He points out that, in spite of the technical advances of recent years, there is much to be done before the diagnosis of early pulmonary tuberculosis is achieved. Increased propaganda and improved dispensary facilities for diagnosis have not materially affected the stage at which the disease is diagnosed, and the majority of sufferers are therefore still unsuitable for modern methods of treatment.

The principal cause of the failure to diagnose tuberculosis at the early stage is that the doctor has had to wait until the patient consults him over symptoms, whereas it is well known that many cases of established phthisis are symptomless. However, there is sometimes a failure to diagnose tuberculosis when warning signs are manifest. These include pleurisy, persistent cough, indigestion, lassitude, fistula-in-ano, amenorrhœa and erythema nodosum. Similarly, there are physical signs present long before adventitious sounds are heard, for example the sternomastoid sign (tension of the homolateral sternomastoid muscle at its origin at the proximal extremity of the clavicle) and lack of movement. Careful physical examination may show that cases considered bronchitic are, from stethoscopy alone, clearly suffering from early active tuberculosis.

Aids to diagnosis are the erythrocyte sedimentation rate, exercise tests and sputum tests, but radiological examination in the hands of a chest physician or radiologist with specialised chest training is much superior to any other method. Radiography is a method which, even at its lowest valuation, is a visual indication of abnormality calling for immediate and strict investigation. The doctor can seek out the patient by this means, as proved by the growing experience of the examination of the supposedly healthy.

The author reviews the results in 30,000 men and 10,000 women in the Royal Air Force examined by mass radiography, using 35 mm. units. In this series the incidence of active tuberculosis was 0·22% for men and 0·38% for women. The figures for inactive tuberculosis were respectively 0·36% and 0·56%. The incidence of active disease was about 1 per 1,000 more for women than for men at the age group 20–24, while the incidence for women under 20 was more than double that for men. Similarly, for inactive cases, the incidence in women under 20 was four times as great as among men, and one and a half times as great in the age group 20–24. The percentages approximate in the age group 25–29. On the basis of the results obtained by this survey, the author estimates that there may be in Britain 15,000 cases of active pulmonary tuberculosis among the supposedly healthy in the age group 18–24 years.

Experience shows that some 25% more cases are found in the early stage of disease by mass radiography than by present civilian methods of diagnosis. While one radiographic examination is useful, it is no guarantee for the future and periodic examinations are desirable.

The author concludes with the recommendation that routine mass radiography of the civil population should begin at school-leaving age and be repeated annually until the age of 30 or 35 is reached.

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THE USE OF SILVER NITRATE IN THE PRODUCTION OF ASEPTIC OBLITERATIVE PLEURITIS

by R. C. Brock, *Guy's Hospital Reports*, **91,** 99–109, 1942

The production of an artificial obliterative pleuritis is of considerable importance in the management of certain chest diseases, and the present paper describes experiences in the use of silver nitrate for this purpose. Adhesions between lung and the parietes may be needed (i) before lobectomy, (ii) to allow suction drainage of a tuberculous cavity, Monaldi's operation, (iii) to cure the condition of chronic or recurrent spontaneous pneumothorax, (iv) to relieve the condition of chronic recurrent idiopathic pleural effusion. The best method of producing pleural obliteration previously described is that of Bethune (1935)—" pleural poudrage "—in which iodised talc powder is blown on to the pleura through a cannula and under thoracoscopic control.

Silver nitrate has several advantages over Bethune's method, not the least being that its use is a simple bedside manœuvre and not even a minor operation. As a result of preliminary animal experiments and subsequent observations in man, the author recommends a 10% solution, the usual dose given being 0·5 cm.³ This is injected into the pleura with an all-glass syringe (to avoid precipitation of silver) after induction of a small pneumothorax, and as much air as possible is removed as soon as the injection has been completed.

As some immediate pain is caused it is advisable to give a preliminary injection of morphia. There is usually a slight febrile reaction lasting 3–5 days and a variable amount of effusion is produced. This and any remaining air should be aspirated so that the pleural surfaces are not kept apart and prevented from adhering. After 3–4 weeks, artificial

pneumothorax is again attempted, and if this is successful, a second injection of silver nitrate may be needed. Usually one dose is sufficient.

The author has used the method in 20 patients before lobectomy, with complete success in 15 cases and partial success in 2 others. Of these 17 patients, 13 had had one injection and 4 had had two. The adhesions found at operation are ideal, being soft and avascular but firm enough to prevent collapse of the remaining lobe.

Twenty patients suffering from chronic or recurrent spontaneous pneumothorax were treated by this method, and in every case the condition was cured. Thoracoscopy is done first to exclude a condition such as congenital cyst which would demand other treatment. The silver nitrate is then injected, and the gradual expansion of the lung is encouraged by aspiration of air and fluid. Among the chronic pneumothorax cases was one lasting 9 years, and in none was the duration less than several months. The recurrent pneumothorax cases had had many attacks, often bilateral. These cases are usually most difficult to treat and cause much disability, and the introduction of the use of silver nitrate provides a simple, safe and certain way to cure them.

The author does not suggest that silver nitrate is the ideal medium for producing aseptic obliterative pleuritis, but his results show that the principle of the injection of an irritant compound is sound. Further work is now in progress with the objects (*a*) of improving the technique of silver nitrate injection, and (*b*) of finding a compound which may be even better for this purpose.

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TRAUMATIC HÆMOTHORAX

by A. Tudor Edwards, *Lancet*, **1**, 97–99, 23/1/43

The treatment of traumatic hæmothorax has long been a subject of controversy and it is natural that the experiences of war should throw new light on this problem. The author, who is Consultant Adviser in Chest Injuries to the Ministry of Health (*Emergency Medical Service*), has analysed the findings in 204 cases of traumatic hæmothorax treated recently in British Chest Centres. The patients were both military and civilian war casualties and only those cases in which the hæmothorax was the predominant lesion were included.

The most important problem is the prevention of sepsis. Of the 204 cases in this series, 40 became infected. With penetrating or perforating wounds caused by small missiles the incidence of septic infection was 22%, while with non-penetrating injuries 11% became infected. The latter figure shows that infection can reach the pleura from the lung or blood stream when the chest is injured, a factor which has previously been regarded as unimportant. The retention of effused blood in the pleura contributes to the production of sepsis. Such blood should be aspirated at once, and aspiration should be repeated on alternate days until the lung has expanded. At the first aspiration it is an advantage to replace the fluid with air, as this allows the pleura to be evacuated without distressing the patient and may help to prevent further bleeding by keeping the lung collapsed. At subsequent aspirations air should not be introduced since it is desirable to maintain as small a pleural pocket as possible in case infection should develop. Blood transfusion may be required if the patient is exsanguinated and very rarely it may be necessary to perform a small thoracotomy in order to evacuate large masses of clot from the pleura. Small retained foreign bodies, not more than 1 cm. in diameter, should be left alone as they do not increase the incidence of infection.

It was not possible to estimate the value of the sulphonamide drugs in this series, but they have been shown to reduce pleural sepsis after operations on the lung and it is therefore suggested that they should always be administered by mouth as early as possible in cases of traumatic hæmothorax. Regular bacteriological examinations of the aspirated fluid should be made, and if infection develops the dose of sulphonamide should be increased and regular aspiration should be continued until the fluid becomes definitely purulent. The empyema will then be localised and should be drained by rib resection at or near the angle of the ninth rib, unless it is encapsulated elsewhere. Closed intercostal drainage in the early stages is not recommended because of the dangers of infection of the tube track and leakage of air into the pleural cavity (which delays expansion). After drainage by rib resection, careful irrigation and the application of negative pressure will hasten obliteration of the empyema. Modern respiratory exercises are essential to restore full pulmonary function as soon as possible, and especially trained masseuses are now employed at all British Chest Centres. Finally, no empyema can be considered as healed until the cavity is completely obliterated, and the tube should never be removed before this stage is reached.

In the whole of the present series only 3 patients died, one after thoracotomy in the presence of infection, one from a severe crush injury, and one after hæmorrhage from a buttock wound. Thus the total mortality in this series, including the 40 infected cases, was one death—0·5%. In only two cases was there severe residual disability and 90% of those aspirated within the first 48 hours had no residual disability whatever.

These results appear to confirm the value of Chest Centres in which special surgical, nursing, and auxiliary services are available.

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THE LOW-PRESSURE PHASE OF BLAST

by A. L. Latner, *Lancet*, **2**, 303–304, 12/9/42

Previous investigators have attached much significance to the high-pressure component of the blast wave as the cause of blast lesions (Zuckerman, 1940). The low-pressure phase has been somewhat neglected, and has not been regarded as a factor which can be primarily responsible for the production of lesions.

The present experiments were carried out to determine the effects, if any, of exposure to low pressures of exceedingly short duration. Mice were used as experimental animals. They were placed in a small thick-walled glass chamber, which was then connected to a three-way tap by means of a thick rubber connection. The apparatus was so arranged that movement of the tap could place the mouse in communication either with atmospheric air or with an 8-litre bottle which was connected to a pump and manometer. The large bottle was evacuated of air as completely as possible and the tap was rapidly turned through 360° to return to its original position. This momentarily placed the small mouse chamber in communication with the large evacuated bottle and then returned it to its original connection with room air. A piece of gauze prevented the mouse from being sucked into the tap.

Death occurred instantaneously, or after a short interval, in approximately half the animals exposed in this manner. Post-mortem examination of the lungs always revealed hæmorrhagic areas, which were not as a rule symmetrically distributed. Occasionally, other hæmorrhagic lesions both intra- and extra-thoracic, were produced. Such lesions have been found in the pericardium, thymus, liver, large intestine, pancreas and fallopian tubes, and their presence shows that extrathoracic lesions produced by blast cannot be brought forward as evidence that the high-pressure component was the injurious factor.

Animals which recovered completely were killed with coal gas at varying intervals after exposure. The recovery process was found to conform closely to previous descriptions in human cases (Hadfield, 1941), even to the occurrence of greyish patches in the midst of hæmorrhagic areas. These areas showed pseudopneumonic mononuclear infiltration which was beautifully demonstrated by using McGregor's azan-carmine stain (McGregor, 1929).

The author concludes that exposure to a rapidly produced low pressure of very short duration is capable of producing injuries similar to those produced by explosion blast, and it may therefore be inferred that the low-pressure phase of blast may possibly have an importance greater than that previously attributed to it.

Discussing the mechanism by which the low-pressure phase produces its effects, the author suggests that the pressure changes of blast are not directly communicated to the inside of the lung, because of the relative narrowness of the trachea and the exceedingly short duration of the blast wave. Under these conditions the intrapulmonary pressure

would be greater than the outside pressure during the low-pressure phase of blast. The large area of body surface would make this pressure difference very effective. The resulting over-inflation of the lungs would tear some of the pulmonary capillaries and so produce hæmorrhagic lesions.

It seems possible that the lung lesions of blast are primarily due to over-stretching of the lung substance (1) during the low-pressure phase, by the mechanism already indicated, and (2) at the end of the high-pressure phase, by the elastic recoil of the thoracic wall occurring after compression. These factors would tend to be additive. As far as the author can ascertain from published work this suggestion has not previously been made. It would indicate a method of preventing blast injuries of the lung. Over-inflation should not occur if the chest were covered with a tight inelastic bandage or jacket.

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TREATMENT OF WOUNDS AND INFLAMMATION BY X-RAYS AND RADIUM RAYS

by N. S. Finzi and F. Freund, *British Medical Journal*, **1,** 34–36, 9/1/43

X-rays were first used in the treatment of inflammatory conditions over forty years ago, but this treatment has since been neglected. It is suggested that the chief reasons for this neglect are that the treatment has universal applications and is therefore regarded with some suspicion, that the use of X and γ rays in malignant growths has distracted attention from other uses, and that incorrect dosage was used.

The authors maintain that by the employment of very small doses it is possible to benefit almost every type of inflammation, both acute and chronic. Most cases respond well, but not all. One of the authors found that experimental wounds of the skin in rabbits heal much more quickly when treated with X-rays. Two photomicrographs accompanying the article illustrate a striking difference in the appearance of irradiated and untreated wounds. Experimental wounds of the rabbit cornea also heal with much less inflammation on the side treated with X-rays. Comparable results were obtained by irradiation of experimental fractures of the fibulæ of rabbits. Healing was more rapid on the treated side and callus was less in quantity and more heavily calcified compared with the control. It was also found that the reaction following inunction of tuberculin into the skin of the rabbit could be prevented by treating the area with X-rays soon after the inunction.

The range of dosage which will cause improvement is wide, but if really big doses are used the effects are reversed, inflammation is increased and necrosis may occur.

Surface wounds heal quickly after irradiation, with loss of pain and diminution of exudate; chronic ulcers become covered with healthy granulations and heal; in ununited fractures X-ray treatment will often induce bony union.

Skiagrams are reproduced of a whitlow with necrosis of the terminal phalanx where the whole of the bone rapidly regenerated after X-ray treatment. The authors refer also to the successful treatment of post-herpetic neuralgia by irradiation of the posterior root ganglia, and they claim that trigeminal neuralgia responds to irradiation of the Gasserian ganglion. As examples of acute inflammations suitable for irradiation the authors cite carbuncles, erysipelas, cellulitis, lymphangitis and gas gangrene. Among sub-acute and chronic inflammations tuberculosis, actinomycosis, septic fingers, osteomyelitis and many other conditions have been treated. X-rays are now often employed prophylactically in plastic surgery for the prevention of keloid. The value both in peace and war of a treatment which will shorten the period of incapacity by accelerating healing needs no emphasis.

The dose should be between 30 *r* and 80 *r*. The former or even less may be applied twice a week, and doses of over 50 *r* upwards once a week. All these are the estimated doses received by the lesion itself. The authors prefer a relatively high voltage with filtration, but the number of *roentgens* must be greater than when a lower voltage and filtration is used. In acute cases it is better to use smaller doses and repeat in three and then in four days. With chronic cases weekly treatments are sufficient.

The authors conclude by suggesting that there will be a wide extension of radiotherapy in the future.

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